PACKAGING

THE CAHNERS MAGAZINE FOR DECISION-MAKERS/MAY 1989

NEW VIEWS ON TAMPER-EVIDENCE

New Machinery Study Pinpoints Growth Areas

Are Paperboard Price Jumps Justified? An Exclusive Survey

Accurate Processing Hikes Bag-Line Output

Juice Bottler Moves To Clearer Polypropylene

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PACKAGING formerly Package Engineering including Modern Packaging (ISSN 0746-3820) is published monthly, except in February, March, June, August and September when two issues are published, in national, demographic and separate editions by The Cahners Publishing Company, A Division of Reed Publishing USA, 275 Washington Street, Newton MA 02158-1630. Terrence M. McDermott, President; Charles E. Moodhe, Senior Vice President/General Manager, Chicago Division; Jerry D. Neth, Vice President/Publishing Operations; J.J. Walsh, Financial Vice President/Magazine Division; Thomas J. Dellamaria, Vice President/Production and Manufacturing. Circulation records are maintained at Cahners Publishing Company, 44 Cook Street, Denver, CO 80206-5900. Phone 303/388-4511. Second-class postage paid at Denver, CO 80206-5800 and additional mailing offices. Postmaster: Send address corrections to PACKAGING at our Denver address. PACKAGING formerly Package Engineering including Modern Packaging, copyright 1989 by Reed Publishing USA; Ronald G. Segal, Chairman and Chief Executive Officer; Robert L. Krakoff, President and Chief Operating Officer; William M. Platt, Sr. Vice President.

PACKAGING NEWS

Demonstration Facility For Combat Rations Announced

Advanced processing, packaging techniques to be developed

The Center for Advanced Food Technology at Rutgers, the State University of New Jersey, has been awarded a major contract by the U.S. Department of Defense to establish and operate a facility to demonstrate advanced manufacturing and packaging technology for combat rations.

The contract is aimed at developing new, highly-automated processes for the manufacture of combat rations. Beef stew will be the initial test product for the project, which will emphasize shelf-stable technology.

The research team will also be looking at the two major packaging types now used for combat rations—pouches and tray packs. A coalition of food, equipment and materials supply companies is currently being assembled to work jointly with CAFT and provide the broad base of technical expertise needed.

According to Dr. Jack L. Rossen, program director for the project, the program "is of extreme interest to industry because it gives them the opportunity to gain new techniques at low cost, and the processes we develop using the latest technology will work for consumer products as well as combat rations."

Beware Plastics Overcapacity, Says Study

Prices may be forced down by 50%

Overcapacity in packaging-grade polymer resins is now likely to emerge within 18 months, and may force prices down by as much as 50 percent over present levels. These are among the findings recently made available in data-base form by Euro-Data Analysts, a UK-based packaging industry consultancy.

The report, entitled, "Worldwide Name Plate Capacity Plans for Packaging Grade Polymer Materials," reportedly provides an overview and perspective on exactly which firms are planning new and incremental capacity. Included is the use of debottlenecking techniques to produce more resin from existing facilities.

The report covers existing and new capacity from 1987-1992 and beyond for the main packaging-grade polymers, including estimated investment costs, locations, joint ventures, cross-selling and marketing agreements, and production process details.

For more information on the report, circle Reader Service No. **484**.

Foodservice Industry Wants Smaller Meat Packs

Participants air "beefs" at AMI roundtable

Meat packers and processors could better serve the foodservice industry if they would provide more product consistency and smaller packs. These conclusions emerged during the American Meat Institute's second foodservice roundtable discussion, held early this year with West Coast foodservice operators and distributors.

Foodservice participants said they would also like more specific product information. This would make selling the products easier and enable distributors to better inform operators about the products they provide their customers. Copies of the full report are available from AMI, P.O. Box 3556, Washington, D.C. 20007.

Sidel Signs With USSR For PET Production

Will provide equipment for 90 million water bottles per year

Sidel, French manufacturer of equipment for making plastic bottles, announced it has signed a contract worth approximately 80 million French francs with the USSR, to provide all necessary equipment for a full polyethylene terephthalate (PET) plastic mineral water bottle manufacturing facility in that country.

Due to come on-stream in Turkmenistan in the spring of 1990, the Soviet facility will reportedly produce 90 million 1.5-liter PET mineral water bottles per year. Delivery of the equipment is planned from July 1989 to January of 1990.

This facility is reportedly the first major step on the part of the USSR in the field of plastic bottles for beverages.

Study Tracks European Aerosol Market

Food sector targeted for growth

The European aerosol market, in spite of competition from pumps and environmental concerns, has more than held its own, and has benefitted from the expansion of important user sectors. These are among the conclusions of a recently released study from ERC Statistics International Ltd., a London based firm.

Haircare products were cited as a key factor in the growth of aerosols. Although growth in that sector is expected to slow down over the next few years, the aerosol market harbours several other areas of potential growth, according to the study.

Aerosol food applications are identified as a potential growth area, with the study citing cream, mustard, tomato sauce and tomato puree. Car-care products and pharmaceuticals are also cited. The study reportedly provides an up-to-date examination of aerosol consumption in seven of Europe's major markets, focusing on current directions in user market performance and areas of potential market expansion into the 1990s.

For more information on the study, circle Reader Service No. **485**.

AEROSOL PACKAGING IN EUROPE

	Total Sales (1988) Million Units	% Growth (1986-1988)
Belgium	1.8	63.2
W. Germany	34.7	24.4
Spain	4.5	180.0
France	37.0	146.7
Italy	16.0	33.3
Netherlands	8.7	74.0
U.K.	41.1	35.2

Source: ERC Statistics International Ltd.

Ball, Yamamura Will Develop Japanese Beverage Can Market

Anticipate building a Japanese can plant

Ball Corp. and Yamamura Glass Co. Ltd. of Nishinomiya, Japan, have entered into an agreement to begin developing a market for lightweight metal beverage cans in Japan. This move is in anticipation of building and operating a beverage can manufacturing facility in Japan "in the future," according to a statement released by Ball. The firm says it is taking steps to establish itself in the burgeoning market for metal beverage containers in the Pacific Rim.

Under the agreement, Yamamura will substantially increase its imports of beverage cans and can ends from Ball plants in the U.S., for sale in Japan. The agreement with Ball marks Yamamura's entry into the metal container industry. The firm is Japan's largest manufacturer of glass bottles.

When the market is developed and a Japanese plant is built, Ball says it will provide state-of-the-art technology to manufacture two-piece aluminum or steel beverage cans and easy-opening can ends. Ball will also provide design and engineering assistance, and will train Japanese can makers at Ball plants in the U.S.

RECYCLING NEWS

Waste Group Receives Art Grant

Funds to be used for design database

What's the National Endowment for the Arts doing awarding a grant to the Packaging Coalition for Solid Waste Management?

Though it may sound strange at first, Stewart Mosberg, president of the coalition, says the grant makes sense when you think of packaging as "a disposable art form." Mosberg, who also is president of the Package Design Council, says the grant will be used to help the coalition fund its design-related programs. "It is a victory," he says, "for all those in the packaging design field so concerned with taking appropriate steps to protect our environment."

Disposable art is an appropriate description of packaging, says the National Endowment for the Arts, which has awarded a grant to the Packaging Coalition for Solid Waste Management.

The idea that packaging design can be a means of reducing trash often seems to be underemphasized these days while landfilling, incineration and recycling get most of the attention. Mosberg says he knows why: "Designers have been creating packaging that is hard to dispose of because easy disposal has not been their objective." But, he notes, use of better materials or perhaps *fewer* materials could indeed help ease the waste crisis.

To illustrate this, he describes wasteful use of cushioning and oversized corrugated cases. "A better design could make use of less material and provide better protection," he says. To aid designers in creating efficient packaging, the coalition will make a computer database accessible to its members. "It will be a source that package designers can go to to create more environmentally sound packaging," Mosberg says. "To create a better lifestyle, designers have to be informed."

Yet he also notes that source reduction is not the only answer. "We suggest that incineration in a controlled fashion—as practiced in Europe and Japan—is one promising solution. Recycling is also a part, but a small part."

Done properly, he says, incineration *is* recycling. "The real point is reclamation—the idea of taking in trash and turning it into something else. Incineration can turn it into steam."

For more information about Mosberg's group, write the Packaging Coalition for Solid Waste Management, Inc., P.O. Box 979 Planetarium Station, New York, N.Y. 10024-0979.

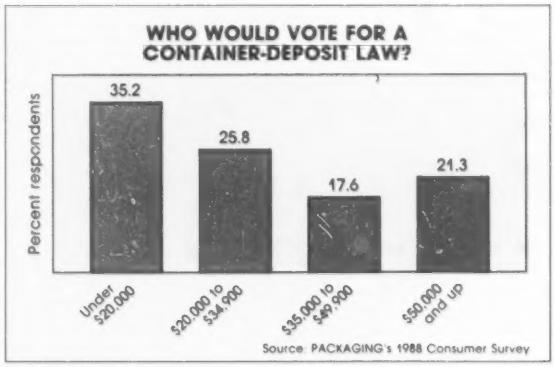
DuPont, State To Test 'Alloys'

Waste plastic may find new use on highways

If all goes well, highway construction and maintenance products made from recycled milk jugs and soft-drink bottles will be in use by the Illinois Department of Transportation within a year. The DuPont Co. and the State of Illinois recently announced formation of a plastics recycling development partnership to develop and test a range of products for use by the IDOT.

DuPont has conducted a great deal of research into combining diverse plastics with "compatibilizers" in order to form plastic alloys. These materials perform as well as virgin resins in some applications.

Karen A. Witter, director of the Illinois Department of Energy & Natural Resources, says "highway construction is the perfect arena in which to test products made from recycled plastics with the goal of demonstrating they can meet the highest standards for quality and performance."



Income Affects Bottle-Bill Support

Those earning least like deposits most

Opinions gathered by PACKAGING's 1988 Consumer Survey show that support for container-deposit laws, or "bottle bills," seems to generally decrease with respondents' income.

Of the consumers reporting that their state had no container deposit law, 35.2 percent having incomes under $20,000 said they would vote to enact such a law. Slightly more than 25 percent having incomes in the $20,000 to $34,000 range said they would support a bottle bill.

Only 17.6 percent in the $35,000-49,900 income bracket said they would do so. Interestingly, support for this type of law rose by almost four percentage points between the $35,000-49,000 bracket and the $50,000-and-up bracket.

A full report on results of PACKAGING's 1989 Consumer Survey will appear in the June issue.

Steel Maker Devours Cans

Company sees waste helping ease shortage

In cooperation with the Steel Can Recycling Institute, Pittsburgh-based Lukens Steel is now recycling more than 225 million steel cans a year.

"Increased efficiency in steel-production technology and the manufacturing processes employed by steel users have combined to create a shortage of steel scrap from traditional sources," says Edgar Fogelman, Lukens vice president. "Steel cans provide an alternative raw material source."

Lukens currently buys more than 1,000 tons of steel scrap each month from two municipal recycling companies. Each year, the Lukens program alone could keep 24 million pounds of steel trash out of landfills in the Pittsburgh area.

The SCRI was established last July by six domestic producers of tin-plate products for the purpose of promoting and sustaining the recycling of steel cans.

TAMPER-EVIDENCE IN PERSPECTIVE

Now that the furor of 1986 has calmed, it's time to consider what more can—and can't—be done to protect packaged food and drugs

By Melissa Larson
Senior Editor

In the frightening days of 1986 and early 1987, when tampering incidents were in the newspapers daily, and no one knew which products might be next, it was hard to see beyond putting out the next fire.

Dealing with recalls, answering the public's concerns and quickly converting to tamper-evident devices absorbed packagers' attention—whether their products were directly involved or not.

In the relative calm of 1989 (the Chilean grape incident notwithstanding), there is time to step back and try to gain a perspective on the long-term issue of protecting retail products from tampering.

Have food packagers done all they can do? Which product categories are still vulnerable? Has tamper-evident technology hit a plateau? And how are we to further educate consumers to check for tampering as a matter of habit?

PACKAGING has gathered some of the latest research and commentary on the nation's current tamper-evident state-of-the-art. Experts in tamper-evident packaging at Arthur D. Little, as well as forensic packaging expert and attorney Walter Stern, have contributed to this report.

As you read their comments, keep in mind the marketing factors and public pressures which will affect tamper-evident packaging in the 1990s, regardless of the advance of new technology.

For instance, rising public concern over solid waste makes the idea of "less packaging" an attractive one to some consumers. Many tamper-evident packages have relied on the *addition* of an extra layer of packaging—a paperboard carton or shrink-wrap—to thwart entry or make it more obvious. How will consumers balance tamper-evidence against what they sometimes perceive as "overpackaging"?

Much has also been written about the difficulties tamper-evident packaging can pose to the elderly and arthritic. Packaging consultants Kline & Company have forecasted a "dramatic shift to plastic and plastic composite tamper-evident packaging devices" by 1993—those gains to come almost entirely at the expense of metal devices. Perceived easier opening of plastic tamper-evident devices is one of the main rea-

Packagers are beginning to put the issue of tamper-evident packaging into perspective in 1989.

Solid-waste concerns and other marketing factors may affect consumer acceptance of tamper-evident packaging

sons, according to Kline.

Also significant is the continuing trend toward bulk sales of such items as candy, dog biscuits, cookies, nuts, salted snacks, dried fruits and the like. Consumers seem to like the idea of picking and bagging more of their own choices, even if the item is available elsewhere in the store in a sealed package. It is hard to imagine any way these bulk items could be protected.

Consumer awareness

Educating consumers to look for signs of tampering is a major theme of this report. Most researchers agree that obvious visual packaging signals of tampering are the only way to insure that shoppers will notice that something is wrong.

But in order to notice anything amiss, there must be a heightened awareness on the part of the consumer, and increased communication between the product's marketers and consumers about what a particular product *should* look like on the shelf.

There is some good news regarding consumer awareness of tampering. According to PACKAGING's latest Consumer Survey, the results of which will appear in the June 1989 issue, the percentage of consumers who avoided purchasing a food or drug product in the last six months because the package appeared to have been tampered with rose from just over 31 percent in 1987 to just over 50 percent in 1989.

Industry committee

Food industry cooperation on joint matters of tamper-evidence and crisis preparedness has apparently succeeded so well that the ad-hoc committee charged with discussing tamper-evident packaging has disbanded.

Two years ago, PACKAGING reported on a special forum of major food processors which met several times under the auspices of the National Food Processors Association to discuss tamper-evident problems unique to the food industry. That forum has disbanded, according to Dr. Michael Kashtock, who originally convened the group.

"Basically, we were able to give participants an opportunity to exchange information, to define what was feasible in the area of food tamper-evidence, and to discuss approaches based on then-available tamper-evident systems," he explained.

He added that the group had originally considered distributing some general guidelines to the food industry at large. However, it had been decided that most food firms were responding "in a low-key but effective manner" to implement tamper-evident packaging and other measures, and that such a distribution wasn't necessary.

"If you surveyed our members, you'd probably find that there's been a leveling-out of activity in tamper-evidence," he added. Indeed, there is general agreement that, for the food product categories where some sort of currently available tamper-evident system is effective, conversion has already taken place.

An objective method for use by food processors in identifying which tamper-evident systems will work best for their products, based on packaging integrity and marketability, has grown out of extensive tampering research conducted by Battelle.

In a report given at Pack Alimentaire '88, James R. Profitt of Battelle's Columbus Division outlined an evaluation approach based on weighing such factors as redundant tamper-evident protection, product category similarity, ease of consumer entry, package/product cost ratios, and difficulty of tamper-evident component removal and reassembly by a potential tamperer.

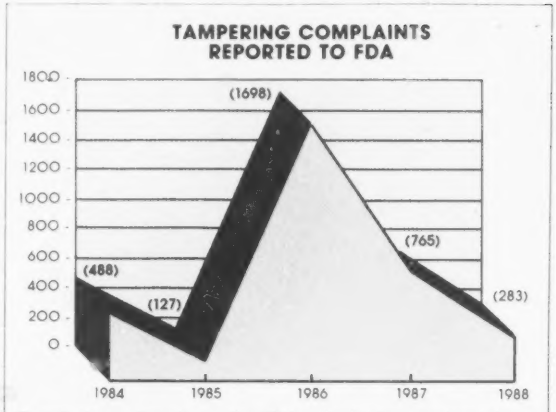
New approaches

Meanwhile, there are new approaches being made available now for tamper-evidence.

For instance, at least one major eye-care marketer is marking its shrink-wrap on-line with an ink-jet coder, rather than relying on pre-printed shrink-wrap. By coding the shrink-wrap on-line with the firm's logo or other easily-identifiable mark, it becomes far less likely that the shrink-wrap could be removed and a facsimile wrap reapplied by a tamperer, without evidence.

Tear-rings combined with flip-top caps into one wide-mouth closure are now available to protect products in wide-mouth containers which need to be opened and closed many times, such as vitamins and analgesics. This type of closure also addresses the easy-opening needs of many consumers.

However, the nagging thought remains: what about cartoned milk? What about candy? What about fresh produce? What about bread? So many of the staple foods American consumers count on cannot now be made tamper-evident without radical packaging changes. New packaging technology and consumer acceptance of risk may have to meet where certain retail products are concerned. □



Graph shows the dramatic 1986 spike in the number of tampering complaints officially reported to the FDA. Activity fell off dramatically in 1988.

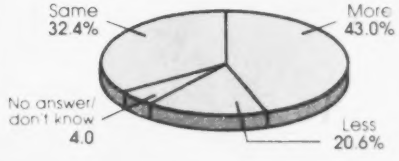
Ross' Murine eye drops are protected by on-line coded shrink-wrap bearing the firm's logo, rather than by pre-printed wrap, which can be stolen or duplicated.

SIMPLICITY AND MAINTENANCE ARE KEY MACHINERY CHARACTERISTICS

RANK	
1.	Simplicity of changeover
2	Ability to clean without disassembly
3	Maximum speed
4	Extra guarding for safety
5	Clean up/changeover without tools
6	Ability to handle wide range of materials/containers
7	Diagnostic panel lights & alphanumeric displays
8	Open construction for accessibility
9	Built-in programmable controllers
10	Price

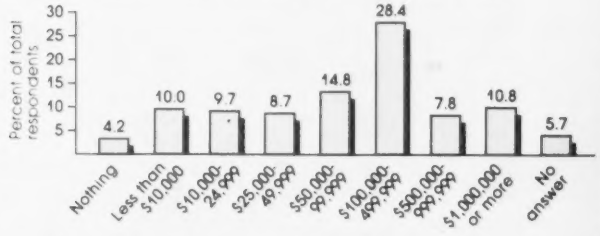
'89 PURCHASE PLANS ARE BULLISH

Percent of total respondents



Slowdown? What slowdown? A majority of respondents say they plan to increase their spending on packaging machinery this year.

PLANNED SPENDING REMAINS HEALTHY



The highest percentages of respondents planning to buy packaging machinery in 1989 say they will spend between $50,000 and $499,999.

Plans Point To Growth In Sales Of Equipment

Packaging pros in exclusive survey foresee strength in machinery market

By Greg Erickson
Senior Editor

If there's an economic downturn in the offing, you wouldn't know it by asking packagers about their equipment plans.

In a report published last March, Cahners Economics saw U.S. economic growth in 1989 slowing to 2.2 percent—about half its 1988 pace. This was seen not as a sign of a recession but as a sort of respite prior to another surge in the 1990s. Cahners Economics noted that the most important factor behind the economy's slight weakness was a continuing slowdown in the industrial sector.

That may have been so, but packaging professionals responding to PACKAGING's 1989 Equipment Survey said they could foresee their equipment purchases remaining strong throughout 1989—and even on into 1990. A total of 1,200 representatives of companies from SIC 20 (Food and Kindred Products) and SIC 28 (Chemicals and Allied Products) responded to the Jan. 1-Feb. 1 survey.

The respondents were in a position to know what they were talking about. More than 60 percent said they had authority to determine need for new packaging machinery, 54.1 percent said they specified or set requirements for such equipment and 56 percent said they selected and/or evaluated suppliers. Nearly 44 percent said they were charged with approving all equipment purchases.

43 percent to spend more

Exactly 43 percent of the surveyed managers reported that they expected their companies to spend more on packaging equipment in 1989 than they did in '88. Slightly more than 30 percent said they would spend the same this year as they did last year. Only 20.6 percent said they would spend less.

Responding professionals came from a wide range of packaging operations. Slightly more than four percent reported that their packaging facility was brand-new—built and opened sometime during the preceding 12 months. Slightly more than 32 percent said their facility had undergone a major renovation over that period, including the addition of new packaging lines. Nearly 58 percent said their facility had not changed in the past year.

Roughly 16 percent of the respondents described their facility as having one to 49 employees. About 19 percent said their location employed between 50 and 99 people. More than 25 percent estimated the work force at 100 to 249 individuals; 16 percent came from companies employing 250 to 499 people; 12 percent came from companies having 500 to 999 employees. Only 11 percent counted 1,000 employees or more.

The average amount spent by foods-segment respondents on packaging equipment in 1988 came to $298,505, the study revealed. The average spent by those in the chemicals segment was $318,159. Average spending estimates for 1989 were higher, demonstrating continued faith in a strong economy: foods, $302,962; chemicals, $359,072.

Expenditures this year in some equipment categories may fall from '88 levels if our respondents' predictions hold true. In most instances this appears to be merely a result of market saturation. For example, the percentage of respondents planning purchases of stretch-wrapping equipment this year fell by five points from the percentage who reported such plans last year. That could be ex-

Respondents have big plans for metal detectors, machine-vision systems and in-line coders

MACHINERY IN USE, FOODS/'88-'89

Equipment	Number in use 1/88	Number in use 1/89
Bagging, preform bags	7,818	8,004
Bar coding/scanning	4,470	4,618
Blowmolding	976	1,007
Bottle cleaning	4,514	4,699
Bottle unscrambling	2,202	2,308
Bundle wrapping/banding	7,924	8,058
Capping	7,397	7,517
Cartoning	7,604	8,027
Case closing/sealing	19,694	20,507
Case forming	9,253	9,097
Case packing	16,535	16,667
Checkweighing	24,118	24,461
Coding and marking	35,361	36,223
Conveying	144,398	147,889
Filling, dry	7,497	7,814
Filling, liquid	18,266	19,050
Form-fill-sealing, horizontal	9,480	9,789
Form-fill-sealing, vertical	8,538	8,765
Gluing, hot-melt	33,739	33,633
Jet printing	14,166	14,737
Label imprinting	4,188	4,368
Labeling	25,473	26,086
Line dividing/conveying	13,206	13,503
Metal detecting	20,001	20,289
Neck banding/body sleeving	618	670
Net weighing	6,050	6,279
Overwrapping	5,563	5,788
Palletizing	14,416	14,496
Shipping tray forming/closing	3,027	3,168
Shrink wrapping	6,683	6,967
Stapling	2,259	2,302
Strapping	4,208	4,369
Stretch wrapping	11,372	11,644
Taping	21,142	21,455
Timing screws	13,653	14,137
UPC scanning	1,970	2,082
Uncasing	3,799	3,977

plained in part by what stretch-wrap machinery manufacturers have told PACKAGING about their 1988 sales. One of them called '88 the best year in the history of his industry.

10 percent spend millions

In PACKAGING's 1989 Equipment Survey, the highest percentage of all respondents said they planned to spend between $100,000 and $499,999 on packaging equipment this year. More than 10 percent of respondents said they expected to spend upwards of a million dollars.

The price of equipment was described as important to the buyers surveyed by PACKAGING. But it was not ranked as high in importance this year as it was last year . . . and not as high as equipment convenience and speed of changeover in either year.

In 1989, when asked to list machinery characteristics in order of importance, survey respondents ranked those denoting simplicity, safety and accessibility higher than price. Almost 44 percent of the combined foods and chemicals respondents—the highest percentage awarding the "extremely important" ranking to any one machine characteristic—called simplicity of changeover most crucial. Only 19.2 percent gave the "extremely important" ranking to price.

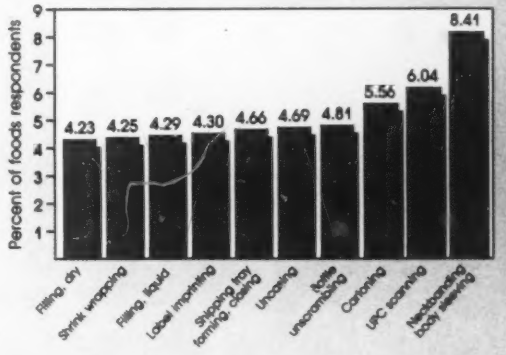
Using information supplied by survey respondents in 1988 and 1989, PACKAGING has been able to project in-use figures for each of 43 machinery categories.

In-use figures projected

Not all types of equipment rose equally in use nationwide from 1988 to 1989. In fact, some categories actually saw a negative change. Among the 10 types of equipment experiencing the greatest rise in use from one year to the next were label-imprinting systems, which grew from 4,188 units in '88 to 4,368 this year. The number of UPC scanners in use '88 to '89 rose from 1,970 units to 2,082—an increase of more than six percent. Neck banding/body sleeving systems led the pack with an in-use growth rate higher than 8.4 percent.

In two categories—case-forming systems and hot-melt gluing systems—the number of machines in use

BANDING LEADS MACHINERY GROWTH



Expected to see the biggest increase in use 1988 to 1989 among foods respondents are neck-banding and body-sleeving systems, most likely as tamper-evident features.

1988-1989 decreased. This appears to be a temporary situation, since 11 percent of the '89 respondents said they planned to purchase case formers this year and 15.7 percent said they would buy hot-melt systems.

Statistics accumulated over the past two years have enabled PACKAGING to track changes in the percentages of respondents planning purchases from one year to the next. Among machine categories with the biggest increases in percentage of respondents planning purchases were these: metal detecting, cartoning, palletizing/depalletizing, machine vision and in-line coding systems.

Among equipment categories seeing the biggest drop in this percentage were conveying, liquid filling, checkweighing, labeling and stretch-wrapping systems. Keep in mind that these decreases do not necessarily spell trouble for manufacturers and distributors of such systems. For instance, even though the percent of respondents planning to buy labeling equipment this year dropped five points from last year, a healthy 14 percent still are planning to buy. Likewise, the percentage of respondents planning new purchases of case closers/sealers fell by three points and that for case formers fell one point; yet growth in sales of both types of systems is expected to continue.

First-time buyers jump in

Reasons for some of the growth in case-handling equipment, as well as in inspecting and labeling/marking equipment, must include the effect of companies making first-time purchases. Of the 12.8 percent of respondents who said they would buy case-packing equipment in 1989, one-quarter called their companies first-time buyers in this equipment category. Of the 22.2 percent planning to purchase jet printing systems in 1989, almost one-quarter said they would be buying such equipment for the first time. And of the 12.9 percent saying they would purchase palletizing/depalletizing systems in 1989, almost exactly one-third described themselves as first-time buyers.

It's in the area of inspection systems that some of the most significant relationships between high future purchase rates and high percentages of first-time buyers were recorded. Of the more than 10 percent of respondents who said they intended to buy UPC scanning equipment and machine vision systems in 1989, close to half of them said they were first-time buyers.

Answers to another survey question set the stage for significant growth in the inspection-systems area. Queried about their rate of inspection and both current and projected use of automatic inspection systems, respondents replied that as their inspection rates went up, so did their use of automatic inspection systems and their projected use of these systems between now and 1990.

Also worth noting are answers to questions regarding the market penetration of robotics. Asked whether any of their machines utilized robotics, only 9.7 percent of the foods respondents and 14.0 percent of the chemicals respondents answered affirmatively. ■

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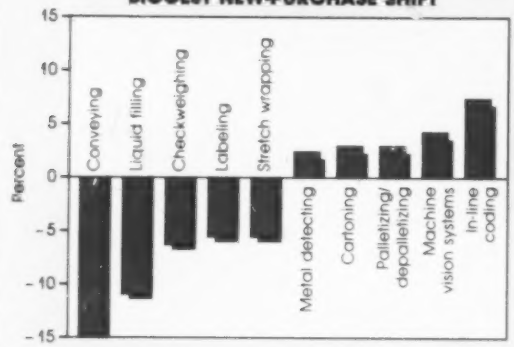
GREG ERICKSON
Senior Editor

"The economists in the White House may have more up-to-date information than PACKAGING's Equipment Survey can dig up about where the whole U.S. economy is going, but they can't match this survey in previewing packaging machinery expenditure trends."

CODING, VISION SYSTEMS SHOW BIGGEST NEW-PURCHASE SHIFT

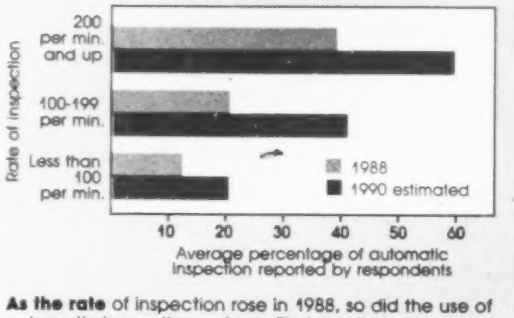


Among the leaders in terms of the increase in percentage of survey respondents planning purchases in the coming 12 months are metal detectors and machine-vision systems.

CODING, LABELING AND WEIGHING SYSTEMS SHOULD BE HOT THIS YEAR

Equipment	Plan to buy in next 12 months — percent of total respondents	First-time buyer in this category — percent of this figure
Case closing/sealing	14.6	14.8
Case forming	11.0	24.8
Case packing	12.8	25.2
Palletizing/depalletizing	12.9	32.5
Checkweighing	19.2	20.1
Machine vision	10.3	47.7
Metal detecting	14.5	17.8
UPC scanning	10.5	44.3
Bar coding/scanning	13.6	37.9
Coding and marking, in-line	21.1	12.9
Jet printing	22.2	23.2
Labeling	19.0	14.8

AUTOMATIC INSPECTION GROWS SIGNIFICANTLY



As the rate of inspection rose in 1988, so did the use of automatic inspection systems. Their use is expected to rise significantly by 1990.